

## CLAIMS

I claim:

1. A method for color calibrating a transmissive display system comprising the steps of:
  - 5 applying signal values that select a target color in a look-up table in said display system to establish color on a screen of said display system;
  - noting color displayed on said screen;
  - comparing said color to said target color to determine if said color is within a specified tolerance range; and
  - 10 calibrating said display system when it is not within said tolerance range to provide a color within said tolerance range.
2. The method of claim 1 wherein said color comparing step includes the steps of:
  - 15 determining an evaluation parameter for said color;
  - determining a target evaluation parameter for said target color;
  - comparing said color evaluation parameter to said target color evaluation parameter to establish a parameter difference value;
  - comparing said parameter difference value to said specified tolerance range;
- 20 and
  - correcting said color when said parameter is not within said tolerance range.
3. The method of claim 2 wherein said correcting step includes the steps of:
  - 25 adjusting said signal values for said target color to obtain modified signal values;
  - establishing an evaluation parameter for color displayed in response to said modified signal values; and
  - comparing said response color to said target color to determine if said response color is within said specified tolerance range of said target color.

4. The method of claim 3 wherein said signals adjusting step includes the steps of:

creating a tristimulus table having tristimulus values for said primary colors for each signal value over an entire signal value range;

5 determining backlight tristimulus values;

subtracting backlight tristimulus values from corresponding tristimulus values in said tristimulus table to provide a corrected table;

subtracting said backlight tristimulus values from corresponding target color tristimulus values to provide corrected target color tristimulus values; and

10 utilizing said corrected table and said corrected target color tristimulus values to obtain estimated primary color luminance values corresponding to said target color.

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5. The method of claim 4 wherein said utilizing step includes the steps of:
  - forming a matrix of primary color tristimulus values obtained by accessing said corrected table at maximum signal values;
  - calculating an inverse matrix of said matrix;
- 5 multiplying a vector formed by said corrected target color tristimulus values by said inverse matrix to obtain a vector of primary color luminance values, each component of said vector representative of a primary color luminance value;
- 10 entering said corrected table with each component of said vector to obtain a new signal value for each primary color luminance value;
- 15 utilizing each new signal value to extract tristimulus values for a corresponding primary color from said corrected table, thereby providing extracted primary color tristimulus values;
  - adding corresponding tristimulus values of said extracted primary color tristimulus values and said backlight tristimulus values to obtain estimated tristimulus values;
  - 15 adding said backlight tristimulus values to corresponding corrected target color tristimulus values to obtain target color tristimulus values;
  - using said estimated tristimulus values to establish an estimated evaluation parameter;
  - 20 comparing said estimated evaluation parameter to said target evaluation parameter; and
  - performing an iteration, utilizing a matrix formed with said estimated tristimulus values and said primary color luminace values, if said estimated evaluation parameter is not within said tolerance.

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6. The method of claim 5 wherein said iteration performing step includes the steps of:
- creating a new matrix utilizing said extracted primary color tristimulus values;
- calculating an inverse matrix of said new matrix, thereby providing a new
- 5 inverse matrix;
- multiplying said vector formed by said corrected target color tristimulus values by said new inverse matrix to obtain a new vector of primary color luminance values, each component of said new vector representative of a primary color;
- 10 entering said corrected table with each component of said new vector to obtain a further new signal value for each primary color;
- utilizing each further new signal value to extract new tristimulus values for a corresponding primary color from said corrected table, thereby providing new extracted primary color tristimulus values;
- 15 adding corresponding tristimulus values of said new extracted primary color tristimulus values and said backlight tristimulus values to obtain new estimated tristimulus values;
- using said new estimated tristimulus values to establish an estimated evaluation parameter;
- 20 comparing said estimated evaluation parameter to said target evaluation parameter; and
- performing another iteration, utilizing a matrix formed with said estimated tristimulus values and said primary color luminance values, if said estimated evaluation parameter is not within said tolerance.

7. The method of claim 5 wherein said another iteration performing step includes the steps of:
- creating a new matrix utilizing said extracted primary color tristimulus values;
  - calculating an inverse matrix of said new matrix, thereby providing a new inverse matrix;
  - 5 multiplying said vector formed by said corrected target color tristimulus values by said new inverse matrix to obtain a new vector of primary color luminance values, each component of said new vector representative of a primary color;
  - 10 entering said corrected table with each component of said new vector to obtain a further new signal value for each primary color;
  - utilizing each further new signal value to extract new tristimulus values for a corresponding primary color from said corrected table, thereby providing new extracted primary color tristimulus values;
  - 15 adding corresponding tristimulus values of said new extracted primary color tristimulus values and said backlight tristimulus values to obtain new estimated tristimulus values;
  - using said new estimated tristimulus values to establish an estimated evaluation parameter;
  - 20 comparing said estimated evaluation parameter to said target evaluation parameter; and
  - modifying said display system to access said new signal value to display said target color if said estimated parameter is within said tolerance range.

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8. The method of claim 7 further including the steps of:
  - applying signal values for a color within said specified tolerance range in a first ambient light condition;
  - lowering said backlight luminance, in a second ambient light condition, from a first backlight luminance until a desired contrast level is achieved, thereby determining a second backlight luminance; and
  - establishing said second backlight luminance for operation in said second ambient light condition.

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9. The method of claim 4 wherein said utilizing step includes the steps of:  
forming a matrix of primary color tristimulus values obtained by accessing  
said corrected table at maximum signal values;  
calculating an inverse matrix of said matrix;  
5 multiplying a vector formed by said corrected target color tristimulus values  
by said inverse matrix to obtain a vector of primary color luminance values, each  
component of said vector representative of a primary color luminance value;  
entering said corrected table with a component of said vector to obtain a new  
signal value for each primary color luminance value;  
10 utilizing each new signal value to extract tristimulus values for a corresponding  
primary color from said corrected table;  
adding corresponding tristimulus values of said primary color tristimulus  
values and said backlight tristimulus values to obtain estimated tristimulus values;  
adding said backlight tristimulus values to corresponding corrected target  
15 color tristimulus values to obtain target color tristimulus values;  
using said estimated tristimulus values to establish an estimated evaluation  
parameter;  
comparing said estimated evaluation parameter to said target evaluation  
parameter; and  
20 modifying said display system to access said new DAC value to display said  
target color if said estimated parameter is within said tolerance range.
10. The method of claim 9 further including the steps of:  
applying signal values for a color within said specified tolerance range;  
25 lowering backlight level from full brightness until a desired contrast level is  
achieved, thereby determining a second ambient light level backlight luminance; and  
establishing said second ambient light level backlight luminance for operation  
in said second ambient light level.

11. The method of claim 1 further comprising the steps of:
  - checking color displayed on said screen in a second ambience light condition, to determine a second ambient light color;
  - comparing said second ambient light color to said target color to determine if said second ambient light color is within said specified tolerance range;
  - adjusting backlight level when said second ambient light color is not within said tolerance range to provide a color within said tolerance range.
12. The method of claim 9 further including the steps of:
  - applying signal values for a color within said specified tolerance range in said first ambient light;
  - lowering backlight luminance from a first luminance level until a second luminance level at which a desired color luminance is achieved in said second ambient light, thereby determining a second ambient light backlight luminance; and
  - establishing said second ambient light backlight luminance for operation in said second ambient light.
13. The method of claim 4 further including the steps of:
  - lowering backlight luminance from a first luminance level to a second luminance level at which a desired color luminance is achieved;
  - establishing a ratio of said first and second luminance levels; and
  - utilizing said ratio to modify said tristimulus table.

14. A transmissive display system comprising:
- a look-up table coupled to receive signals representative of colors to be displayed on a screen of said transmissive display system, said look-up table having data accessed by said signals, said data determining illumination levels of primary color filters associated with pixels on said screen;
- 5 a backlight providing illumination of said primary color filters; and
- a processor coupled to said backlight wherein backlight luminance is selected in accordance with ambient light conditions.
- 10 15. A transmissive display system in accordance with claim 14 wherein said processor includes a light sensor that senses ambient light levels and selects backlight luminance in accordance with sensed ambient light levels.
- 15 16. A transmissive display system in accordance with claim 14 wherein said processor includes a light sensor that senses ambient light levels and provides an indication of optimum backlight luminance.
- 20 17. A transmissive display system in accordance with claim 14 wherein said processor includes a ratio determinator which provides a ratio of a first backlight luminance to a second backlight luminance; and
- a luminance modifier coupled to said ratio determinator to modify target color luminance in accordance with said ratio.
- 25 17. A transmissive display system in accordance with claim 16 wherein said processor further includes a ratio determinator which provides a ratio of a first backlight luminance to a second backlight luminance; and
- a luminance modifier coupled to said ratio determinator to modify target color luminance in accordance with said ratio.